

U.S.S.N. 10/065,037

2

15-MG-6125 (GEMS 0139 PA)

REMARKS

In the Office Action dated November 3, 2003, claims 1-20 are pending. Claims 1, 9, and 19 are independent claims from which the remaining claims 2-8, 10-18, and 20 depend therefrom.

The drawings stand objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include reference signs mentioned in the description of the application. Specifically, numerical designators 16, 54, and 56, for the super conducting magnet field coils, the second exterior side, and the cylindrical dielectric former, are not shown in Figure 1. Figure 1 has been corrected to include numerical designators 16, 54, and 56 and is attached herewith. Please substitute the one sheet of drawings submitted herewith containing Figures 1 and 2 in place of the originally filed drawing sheet containing the same figures. The Applicants submit that the drawings are now in a condition for approval.

Claims 1-17 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Kinanen (USPN 6,433,550 B1).

Claims 1, 9, and 19 have similar limitations and will therefore be discussed together. Claim 1 recites a Magnetic Resonance Imaging (MRI) magnet field instability simulator that includes a rigid body motion generator, which simulates motions of one or more MRI system components. An eddy current analyzer generates a magnetic stiffness and damping signal and an electromagnetic transfer function in response to the motions and a cryostat material properties signal. A mechanical model generator generates a mechanical disturbance signal and a mechanical model of one or more MRI system components in response to the motions and the magnetic stiffness and damping signal. A structural analyzer generates a motion signal in response to the mechanical model. A field instability calculator generates a field instability signal in response to the electromagnetic transfer function and the motion signal. Claims 9 and 19 recite methods of performing the same.

U.S.S.N. 10/065,037

3

15-MG-6125 (GEMS 0139 PA)

The system and methods of claims 1, 9, and 19 provide a simulation tool for simulating effects of MRI main field disturbances within a MRI system. This simulation tool allows for improved and more efficient engineering of MRI system components. The term "simulate" refers to the plain ordinary definition of the term, which is to provide an imitative representation of the functioning of a system or process. For example, simulate may refer to the tasks performed by a device that enables an operator to reproduce or represent under test conditions phenomena likely to occur in actual performance. For the definitions provided in this response see Webster's Third New International Dictionary. Thus, the system and methods of claims 1, 9, and 19 do not refer to an MRI system for the scanning and imaging of a patient, but rather refer to a system and methods of simulating conditions, operations, or phenomena that occur during the operation of a MRI system.

The Office Action states that the simulator of claim 1 is interpreted as a MRI device capable of analyzing and producing corrections for instabilities produced therein. As stated above, the simulator of claim 1 is not referring to an MRI system. The simulator of claim 1 is also not referring to an MRI system that is capable of detecting instabilities in its operation and performing corrections thereto. The simulator of claim 1 is referring to a device that generates a model that represents the operation of a MRI system.

Kinanen discloses a MRI system with vibration compensation. The MRI system includes a force transducer or vibration sensor for sensing vibration within an MRI magnet. A vibration analyzer, a shim coil, and a reconstruction processor are used to compensate for the vibration experienced by the MRI magnet.

In paragraph 6, the Office Action states that Kinanen teaches and suggests components comprising a rigid body motion generator. Applicants, respectfully, submit that Kinanen does not teach or suggest a rigid body motion generator that simulates motions of one or more MRI system components. The force transducer of Kinanen, as stated in the Office Action, senses vibrations in actual MRI system components of an MRI system. The force transducer does not simulate vibrations or motions that may occur in a MRI system component. Note that the rigid body

U.S.S.N. 10/065,037

4

15-MG-6125 (GEMS 0139 PA)

motion generator of claim 1 is not physically coupled to an MRI system, as is the force transducer of Kinanen. The Office Action further states that the term "simulate" is the same as "account for" and "compensate for", Applicants, respectfully, disagree. Account for and compensate for, simply mean to include or to make up for in ones reasoning when performing a task, whereas simulate means to duplicate or represent. Thus, Kinanen does not teach or suggest a rigid body motion generator, as stated in claim 1, nor does it perform the corresponding functions thereof as recited in claims 1, 9, and 19.

In paragraph 7, the Office Action states that Kinanen lacks directly teaching of an eddy current analyzer. Applicants submit that Kinanen fails to teach or suggest an eddy current analyzer. The Office Action states that Kinanen discloses RF screens that are used to minimize RF eddy currents produced by gradient coils. The minimization of eddy currents is not the same as the analyzing of eddy currents. Although the shim coils of Kinanen reduce eddy currents, they do not detect and analyze eddy currents. The shim coils do not generate magnetic stiffness and dampening signals nor do they generate an electromagnetic transfer function, as does the eddy current analyzer of claim 1, and as included in claims 1 and 19. Also, the shim coils of Kinanen do not perform in response to motions generated by a rigid body motion generator nor do they perform in response to a cryostat material properties signal. Nowhere in Kinanen is an eddy current analyzer mentioned nor is the recited performance thereof taught or suggested, as recited in claims 1, 9, and 19.

In paragraph 8, the Office Action states that Kinanen suggests generating a magnetic stiffness and damping signal and refers to col. 4, lines 21-52, which refer to the signals generated by the force transducer. Signals generated by a force transducer are clearly different than signals generated by an eddy current analyzer. The force transducer, as stated detects vibrations within an MRI system, the eddy current analyzer of claim 1 analyzes signals generated by a rigid body motion generator.

The Office Action states that the output voltage of the force transducer of Kinanen is an electromagnetic transfer function. The output voltage of the force

U.S.S.N. 10/065,037

5

15-MG-6125 (GEMS 0139 PA)

transducer represents actual vibrations within an MRI system. The electromagnetic transfer function of claim 1 is generated in response to simulated motions. The output voltage of the force transducer is simply a direct response from a sensor, whereas the electromagnetic transfer function is the result of an eddy current analysis. The electromagnetic transfer function may for example relate field disturbances to component or unit motions. The output voltage of Kinanen is clearly not the same as the electromagnetic transfer function of claims 1, 9, and 19.

In paragraph 9, the Office Action states that Kinanen teaches or suggests a mechanical model generator. In so doing, the Office Action again refers to the force transducer of Kinanen. Again the force transducer of Kinanen simply detects vibration within an MRI magnet and in response thereto generates a vibration signal. The force transducer does not generate a mechanical model of one or more MRI system components. A mechanical model may include geometries, materials and respective properties, boundary conditions, and other system parameters and characteristics. The mechanical model is a representative model of an MRI system component it is not the same as the vibration detected from an actual MRI magnet.

Note that the Office Action relies on the force transducer of Kinanen for the teaching and suggestion of three different devices recited in claim 1. Also, as an example, to further describe the difference between the devices recited in the limitations of claim 1 and the force transducer of Kinanen, the devices of claim 1 may be part of a microprocessor and be in the form of software based modules, this is unlike the force transducer of Kinanen.

The Office Action does not comment in regards to two elements of claim 1, namely the structural analyzer and the field instability calculator, except for comments with respect to claims 6 and 7 and related method claims 12 and 13. Applicants submit that the structural analyzer and the field instability calculator are also not taught or suggested by Kinanen. Note that the vibration analyzer and vibration analyzing processor of Kinanen are not the same as the structural analyzer and the field instability calculator of claim 1 nor are their functions the same. The vibration analyzer of Kinanen determines distances between an upper pole assembly

U.S.S.N. 10/065,037

6

15-MG-6125 (GEMS 0139 PA)

and a lower pole assembly and shifts the frequency sensitivity of a receiver. The vibration analyzer does not generate a motion signal in response to a mechanical model. Nowhere in Kinanen is a mechanical model disclosed, taught, or suggested. The vibration analyzing processor analyzes the sensed vibrations from the force transducer and determines compensations to dampen vibrations generated from the MRI magnet. The vibration processor of Kinanen does not generate a field instability signal in response to an electromagnetic transfer function and a motion signal. Nowhere in Kinanen is an electromagnetic transfer function disclosed, taught, or suggested.

Thus, Kinanen does not teach or suggest any of the limitations recited in claims 1, 9, and 19, therefore, claims 1, 9, and 19 are novel, nonobvious, and are in a condition for allowance.

Additionally, referring to MPEP 2141.01(a), while the Patent Office classification of references and cross-references in the official search notes are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight." *In re Ellis*, 476 F.2d 1370, 1372, 177USPQ526, 527 (CCPA 1973). Kinanen would not have logically commended itself to an inventor's attention in considering the problems solved by the system and methods of claims 1, 9, and 19. In developing a system for simulating an MRI system for the development of MRI system components, one would clearly not look to an MRI system that is capable of compensating for vibration experienced therein. Kinanen is not reasonably pertinent to the particular problems solved by the system and methods of claims 1, 9, and 19. Thus, the Applicants submit that Kinanen is nonanalogous art.

The Applicants therefore submit that the rejections with regards to claims 1, 9, and 19 have been overcome and since claims 2-8, 10-18, and 20 depend from claims 1, 9, and 19, respectively, they are also novel, nonobvious, and are in a condition for allowance for at least the same reasons.

U.S.S.N. 10/065,037

7


15-MG-6125 (GEMS 0139 PA)

In light of the remarks, Applicants submit that all rejections are now overcome. The application is now in condition for allowance and expeditious notice thereof is earnestly solicited. Should the Examiner have any questions or comments, she is respectfully requested to call the undersigned attorney.

The Commissioner is hereby authorized to charge any fees related to this Office Action response or credit any overpayments to Deposit Account No. 50-0476.

Respectfully submitted,

ARTZ & ARTZ P.C.

  
\_\_\_\_\_  
Jeffrey J. Chapp, Reg. No. 50,579  
28333 Telegraph Road, Suite 250  
Southfield, MI 48034  
(248) 223-9500

Dated: January 9, 2004